Breeding patterns for western brush wallaby (*Notamacropus irma*) in the southern jarrah forest.

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Introduction

The western brush wallaby (*Notamacropus irma*) is a medium-sized macropod endemic to south-western Australia. At 7 - 10 kg (Morris and Christensen 2008), it is listed as least concern under the IUCN Red List of Threatened Species (Woinarski and Burbidge 2016), but it is listed as a priority four species at the State level by the Department of Biodiversity, Conservation and Attractions (DBCDBCA (Department of Biodiversity Conservation and Attractions)21) . It occurs in a wide range of habitats including open forest and woodland (Woinarski and Burbidge 2014). The western brush wallaby is unusual amongst macropods, being generally solitary except during breeding (Algar 1986; Bamford and Bamford 1999; Christensen 1995).

Relatively little is known about the Western Brush Wallaby given its cryptic habit and the difficulties experienced in capturing individuals using conventional trapping techniques. In particular, there is little information available on reproduction for the species (Woinarski et al. 2014). While the gestation period for western brush wallaby is not known to us, we estimate it to be about 30 days given the gestation period of the sympatric large macropods Tammar wallaby (*Macropus eugenii,* 29.3 days) and western grey kangaroo (*Macropus fuliginosus*, 30.6 days) and the average for Macropodidae being about 32 days (Hume et al. 1989). Pouch life in the Macropodidae varies greatly between species but is typically 150 – 320 days and the juveniles of larger kangaroo species may spend many months getting in and out of the pouch (Hume et al. 1989).

Western brush wallabies reportedly appear to be born in April – May and emerge from the pouch in October – November (Christensen 1983, 1995; Morris and Christensen 2008). However, some observations around the Perth region seem to vary from this. Bamford and Bamford (1999) caught a female with a pouch young in February and a second female with no pouch young but with an immature and possibly dependent female in June. Nicole Willers (pers comm.) observed in October, a couple of females with pouch young of various sizes, four females with regressing teats, and one with a lactating teat, indicating it had a young a foot. Dave Algar (1986) observed pouch young throughout the year at Harry Waring Reserve, however numbers were greatest in summer.

The purpose of report was to opportunistically use information from a large camera trapping study in the southern jarrah forest to gain extra information on the breeding patterns of the western brush wallaby.

Method

The "South West Threatened Fauna Recovery Project" in the southern jarrah forest involved 40 sites, each with 50 camera trap points (Wayne et al. 2019, in review). The study involved 10 trials each involving 4 sites (2 transects (5 km with 100m intervals) and 2 grids (40m x 200m)) run simultaneously for about a month. There was a 1–2-week interval between successive trials. The study resulted in a total of 54,361 camera trap nights at 2,000 bait locations and recorded 1.19 million images of fauna over a 15-month period (October 2016 – November 2017). A total of 1,237 independent detection events of western brush wallaby were recorded during this study. The images from these detection events were examined to assess the age and pouch status of western brush wallabies over time.

The wallabies in the images were categorised as either Adult, Subadult and Joey at heal. For those that were deemed to be adults, additional information about breeding status were classified where information was available:

1	Female with small bulge in pouch
2	Female with **large bulge** in pouch
3	Pouch young **protruding** from pouch
4	**Transitioning**- joey in & out of pouch
5	Male protruding penis
6	**Mating**

The remaining categories were then broken down into the number of records in each transect and arial grid over each month. This revealed a distinct period of the year for each gestation stage in the western brush wallaby.

Results

Of the 1237 detection events of western brush wallaby 95% involved adults, 6% involved subadults and 0.8% involved joeys at heal. While most events involving adults (n=1173) detected only one adult (92.1%), two adults were observed 7.8% of the time, and 3 adults were observed 0.17% of the time (2 occasions, one in each of October and November).

Possible small bulging pouches in adult females were recorded in most months. Confidently determining small bulging pouches in adult females was somewhat unreliable as a potential indicator of pouch young being present and so was disregarded as a category. Similarly, observations of males with a protruding penis also occurred in most months and was considered an unreliable indicator of potential breeding activity or season, and so was therefore also disregarded.

Observations of the timing in relation to breeding status were examined at the site level rather than the camera level because of the potential for a lack of spatial independence in the observations within sites (i.e., there is a chance that the same individual may have been detected repeatedly on the same or different cameras within sites). Sites were considered independent given the distances between nearest neighbours (generally about 5 km) and the temporal separation of sampling between adjacent sites.

A clear pattern of breeding was evident from the data (Table 1). Mating was observed (n=4) between February and March, there were large pouches June – November, joeys protruded from the pouch September-October, joeys were observed going in and out of the pouch or at heal in October – November and subadults were recorded October to June. There was also one case of a joey at heal observed in April. Subadults were observed with adults between November and April.

Discussion

The western brush wallaby breeding season observed in this study is consistent with and provides more detail to the earlier reported observations of Christensen (1983). Mating occurred in late summer and autumn (February – April), large pouch young were evident June- November and pouch emergence was observed in October- November.

The observation of a joey at heal in April also indicates that there may be a smaller proportion of individuals that breed six months out of phase with main breeding season (i.e., conception in late winter-early spring).

It is unknown how long offspring remain dependent on their mothers but subadults were observed with adults between November and April. This suggests that they may be at least associated with their mother until they are up to about 12 months of age.

Table 1. Summary of the observations of breeding and development of western brush wallaby in the southern jarrah forest, Western Australia.

Number of events is the total number of independent detection events observed for a given breeding category. The numbers listed under each month relate to the number of sites where that breeding or development category was observed. There was a maximum of 4 sites running concurrently at any time during the study period (October 2016 – November 2017). Those months when breeding/development categories were recorded are highlighted.

Breeding/Development category	No. Events	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mating observed	4		1	1	1								
Large bulging pouch	61						1	2	1	1	3	3	
Protruding pouch young	9									2	1		
Transition	4										2	2	
Joey at heal	10				1						1	3	
Subadult	77	2	2	2	1		1				1	1	3

References

Algar, D. (1986). An Ecological Study of Macropodid Marsupial Species on a Reserve. Doctor of Philosophy Thesis. The Western Australia University.

DBCA (2021). Threatened and priority fauna list. Threatened animals - Parks and Wildlife Service (dpaw.wa.gov.au). Downloaded 25/2/21.

Bamford, M. J. and Bamford, A. R. (1999). A study of the Brush or Black-gloved Wallaby Macropus irma (Jourdan 1837) in Whiteman Park. Report. Whiteman Park.

Christensen, P. (1983). Western brush wallaby, Macropus irma, page 235. *In* Complete book of Australian mammals: the National Photographic Index of Australian wildlife. Ronald Strahan (Ed.).

Christensen, P. (1995). Western Brush Wallaby *Macropus irma*. In The Mammals of Australia: The National Photographic Index of Australian Wildlife. (Ed. R. Strahan) pp. 341-342. (Reed New Holland: Sydney, Australia.)

Hume, I. D., et al. (1989). 29. Macropodidae. Fauna of Australia: Mammalia, Vol. 1B. D. W. Walton and B. J. Richardson. Canberra, Australian Government Printing Service**:** 679-715.

Morris, K. D., and P. Christensen (2008). Western Brush Wallaby. The Mammals of Australia. Third edition. S. van Dyck and R. Strahan. Sydney, Reed New Holland**:** 340-341.

Woinarski, J., Burbidge, A., and Harrison, P. (2014). The Action Plan for Australian Mammals 2012. (CSIRO Publishing.)

Woinarski, J. & Burbidge, A.A. (2016). *Macropus irma*. *The IUCN Red List of Threatened Species* 2016: e.T12626A21953231. https://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T12626A21953231.en. Downloaded on 25 February 2021.